

AMENDMENTS TO THE CLAIMS

1. (Original) An ink composition comprising:

a coloring agent;

an organic solvent;

water; and

a surfactant having difference  $d_l$  ( $\sigma_{10}-\gamma$ ) which is difference between dynamic surface tension ( $\sigma_{10}$ ) of the solution obtained by making 0.1 wt% solution dissolved in purified water to be measured by using a maximum bubble pressure method at the bubble frequency of 10Hz at a temperature from 24 °C to 26 °C and static surface tension ( $\gamma$ ) to be measured at a temperature from 24 °C to 26 °C and which satisfies the following expression (1):

$$0\text{mN/m} \leq d_l \leq 15\text{mN/m} \quad (1)$$

2. (Original) The ink composition of claim 1, wherein the dynamic surface tension ( $\sigma_{10}$ ) at the bubble frequency of 10 Hz and the static surface tension ( $\gamma$ ) are within a range from 20 to 70 mN/m.

3. (Original) The ink composition of claim 1, wherein the medium contains at least either of a glycol ether and a polyhydric alcohol.

4. (Original) The ink composition of claim 1, wherein the coloring

agent includes a dye.

5. (Original) The ink composition of claim 1, wherein the coloring agent includes a pigment.

6. (Original) The ink composition of claim 5, wherein the pigment has a hydrophilic group.

7. (Original) The ink composition of claim 1, wherein the surfactant includes a nonionic surfactant.

8. (Original) The ink composition of claim 1, wherein the surfactant is contained at a critical micelle concentration or higher.

9. (Original) The ink composition of claim 5, wherein the pigment includes at least either of C. I. Pigment blue 15:3 and C. I. Pigment blue 15:4.

10. (Original) The ink composition of claim 5, wherein the pigment includes at least one selected from the group consisting of C. I. Pigment red 122, C. I. Pigment red 209 and C. I. Pigment violet 19.

11. (Original) The ink composition of claim 5, wherein the pigment includes at least one selected from the group consisting of C. I.

Pigment yellow 74, C. I. Pigment yellow 138, C. I. Pigment yellow 150 and C. I. Pigment yellow 180.

12. (Original) The ink composition of claim 5, wherein the pigment includes carbon black.

13. (Original) A recording method for recording an image comprising:  
    depositing an ink composition on a recording material,  
    wherein the ink composition of claim 1 is used as the ink composition.

14. (Original) A recording method for recording an image comprising:

    pressurizing an ink composition to discharge a liquid droplet of the ink composition; and

    depositing the liquid droplet on a recording material,

    wherein the ink composition of claim 1 is used as the ink composition.

15. (Currently Amended) The method of claim 13, wherein the ink composition ~~employs at least the ink composition of claim 9; the ink composition of claim 10; and the ink composition of claim 11~~ comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19, and (3) at least one selected from the group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment yellow 180.

16. (Currently Amended) The method of claim 14, wherein the ink composition ~~employs at least the ink composition of claim 9; the ink composition of claim 10; and the ink composition of claim 11~~ comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19, and (3) at least one selected from the group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment yellow 180.

17. (Currently Amended) The method of claim 13, wherein the ink composition ~~employs at least the ink composition of claim 9; the ink composition of claim 10; the ink composition of claim 11; and the ink composition of claim 12~~ comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19, (3) at least one selected from the group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment yellow 180, and (4) carbon black.

18. (Currently Amended) The method of claim 14, wherein the ink composition ~~employs at least the ink composition of claim 9; the ink composition of claim 10; the ink composition of claim 11; and the ink composition of claim 12~~ comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19, (3) at least one selected from the group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment yellow 180, and (4) carbon black.

19. (Original) A recorded image recorded by the recording method of claim 13.

20. (Original) A recorded image recorded by the recording method of claim 14.

21. (Currently Amended) An ink set comprising:

~~the ink composition of claim 9;~~

~~the ink composition of claim 10; and~~

~~the ink composition of claim 11~~

an ink composition comprised of a coloring agent, an organic solvent, water, and a surfactant having difference  $d1$  ( $\sigma_{10} - \gamma$ ) which is difference between dynamic surface tension ( $\sigma_{10}$ ) of the solution obtained by making 0.1 wt% solution dissolved in purified water to be measured by using a maximum bubble pressure method at the bubble frequency of 10Hz at a temperature from 24 °C to 26 °C and static surface tension ( $\gamma$ ) to be measured at a temperature from 24 °C to 26 °C and which satisfies the following expression (1)

$$0\text{mN/m} \leq d1 \leq 15\text{mN/m} \quad (1)$$

wherein said coloring agent comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group

consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19, and (3) at least one selected from the group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment yellow 180.

22. (Currently Amended) An ink set comprising:

~~the ink composition of claim 9;~~

~~the ink composition of claim 10;~~

~~the ink composition of claim 11; and~~

~~the ink composition of claim 12~~

an ink composition comprised of a coloring agent, an organic solvent, water, and a surfactant having difference  $dl$  ( $\sigma_{10} - \gamma$ ) which is difference between dynamic surface tension ( $\sigma_{10}$ ) of the solution obtained by making 0.1 wt% solution dissolved in purified water to be measured by using a maximum bubble pressure method at the bubble frequency of 10Hz at a temperature from 24 °C to 26 °C and static surface tension ( $\gamma$ ) to be measured at a temperature from 24 °C to 26 °C and which satisfies the following expression (1)

$$0\text{mN/m} \leq dl \leq 15\text{mN/m} \quad (1)$$

wherein said coloring agent comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I.

Pigment violet 19, (3) at least one selected from the group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment yellow 180, and (4) carbon black.

23.(Original) An ink head comprising:

an ink tank for storing the ink composition of claim 1;

an ink chamber having a discharge port for discharging a liquid droplet of the ink composition and receiving a supply of the ink composition from the ink tank;

a piezoelectric element generating a strain in response to an applied voltage and provided at least in a part of the ink chamber thereby applying a pressure to the ink composition contained in the ink chamber; and

an electrode provided for applying a voltage to the piezoelectric element.



24.(Original) An ink head comprising:

an ink tank for storing the ink composition of claim 1;

an ink chamber having a discharge port for discharging a liquid droplet of the ink composition and receiving a supply of the ink composition from the ink tank;

a heat generating member provided in at least a part of the ink chamber and adapted to heat the ink composition contained in the ink chamber to generate a bubble therein thereby applying a pressure to the ink composition; and

an electrode provided for applying a voltage to the heat generating member.

25.(Original) A recorded image recorded by a deposition of a liquid droplet of an ink composition, discharged by the ink head of claim 23, onto a recording material.

26.(Original) A recorded image recorded by a deposition of a liquid droplet of an ink composition, discharged by the ink head of claim 24, onto a recording material.

27.(Original) An ink composition comprising:

a coloring agent;

an organic solvent;

water; and

a surfactant having difference  $d_2$  ( $\sigma_{10} - \sigma_1$ ) which is difference between dynamic surface tension ( $\sigma_{10}$ ) measured at the bubble frequency of 10Hz among dynamic surface tensions of the solution obtained by making 0.1 wt% solution dissolved in purified water to be measured by using a maximum bubble pressure method at a temperature from 24 °C to 26 °C and dynamic surface tension ( $\sigma_1$ ) to be measured at the bubble frequency of 1Hz and which satisfies the following expression (2)

$$0\text{mN/m} \leq d_2 \leq 15\text{mN/m} \quad (2) .$$

28.(Original) The ink composition of claim 27, wherein the dynamic surface tension ( $\sigma_{10}$ ) at the bubble frequency of 10 Hz and the dynamic surface tension ( $\sigma_1$ ) at the bubble frequency of 1 Hz are within a range from 20 to 70 mN/m.

29.(Original) The ink composition of claim 27, wherein the medium includes at least either of a glycol ether and a polyhydric alcohol.

30.(Original) The ink composition of claim 27, wherein the coloring agent includes a dye.

31.(Currently Amended) The ink composition of claim 27, wherein ~~that~~ the coloring agent includes a pigment.

32.(Original) The ink composition of claim 31, wherein a pigment has a hydrophilic group.

33.(Original) The ink composition of claim 27, wherein the surfactant includes a nonionic surfactant.

34.(Original) The ink composition of claim 27, wherein the surfactant is contained by a critical micelle concentration or higher.

35.(Original) The ink composition of claim 31, wherein the pigment includes at least either of C. I. Pigment blue 15:3 and C. I. Pigment blue 15:4.

36.(Original) The ink composition of claim 31, wherein the pigment includes at least one selected from the group consisting of C.I. Pigment red 122, C. I. Pigment red 209 and C.I. Pigment violet 19.

37.(Original) The ink composition of claim 31, wherein the pigment includes at least one selected from the group consisting of C.I.

Pigment yellow 74, C. I. Pigment yellow 138, C.I. Pigment yellow 150 and C. I. Pigment yellow 180.

38.(Original) The ink composition of claim 31, wherein the pigment includes carbon black.

39.(Original) A recording method for recording an image comprising:

depositing an ink composition on a recording material,

wherein the ink composition of claim 27 is used as the ink composition.

40.(Original) A recording method for recording an image comprising:

pressurizing an ink composition to discharge a liquid droplet of the ink composition; and

depositing the liquid droplet on a recording material,

wherein the ink composition of claim 27 is used as the ink composition.

41.(Currently Amended) The method of claim 39, wherein the ink composition ~~employs at least the ink composition of claim 35; the~~

~~ink composition of claim 36; and the ink composition of claim 37~~  
comprises at least one pigment selected from the group consisting  
of (1) at least one selected from the group consisting of C.I.  
Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one  
selected from the group consisting of C.I. Pigment red 122, C.I.  
Pigment red 209, and C.I. Pigment violet 19, and (3) at least one  
selected from the group consisting of C.I. Pigment yellow 74, C.I.  
Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment  
yellow 180.

42.(Currently Amended) The method of claim 40, wherein the ink  
composition ~~employs at least the ink composition of claim, 35; the~~  
~~ink composition of claim 36; and the ink composition of claim 37~~  
comprises at least one pigment selected from the group consisting of  
(1) at least one selected from the group consisting of C.I. Pigment  
blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from  
the group consisting of C.I. Pigment red 122, C.I. Pigment red 209,  
and C.I. Pigment violet 19, and (3) at least one selected from the  
group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138,  
C.I. Pigment yellow 150, and C.I. Pigment yellow 180.

43.(Currently Amended) The method of claim 39, wherein the ink  
composition ~~employs at least the ink composition of claim 35; the~~

~~ink composition of claim 36; the ink composition of claim 37; and~~  
~~the ink composition of claim 38~~ comprises at least one pigment  
selected from the group consisting of (1) at least one selected from  
the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue  
15:4, (2) at least one selected from the group consisting of C.I.  
Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19,  
(3) at least one selected from the group consisting of C.I. Pigment  
yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and  
C.I. Pigment yellow 180, and (4) carbon black.

44.(Currently Amended) The method of claim 40, wherein the ink  
composition employs ~~at least the ink composition of claim 35; the~~  
~~ink composition of claim 36; the ink composition of claim 37; and~~  
~~the ink composition of claim 38~~ comprises at least one pigment  
selected from the group consisting of (1) at least one selected from  
the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue  
15:4, (2) at least one selected from the group consisting of C.I.  
Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19,  
(3) at least one selected from the group consisting of C.I. Pigment  
yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and  
C.I. Pigment yellow 180, and (4) carbon black.

45.(Original) A recorded image recorded by the recording method of  
claim 39.

46.(Original) A recorded image recorded by the recording method of claim 40.

47.(Currently Amended) An ink set comprising:

~~the ink composition of claim 35;~~

~~the ink composition of claim 36; and~~

~~the ink composition of claim 37~~

an ink composition comprised of a coloring agent, an organic solvent, water, and a surfactant having difference  $dl$  ( $\sigma_{10} - \sigma_1$ ) which is difference between dynamic surface tension ( $\sigma_{10}$ ) of the solution obtained by making 0.1 wt% solution dissolved in purified water to be measured by using a maximum bubble pressure method at the bubble frequency of 10Hz at a temperature from 24 °C to 26 °C and dynamic surface tension ( $\sigma_1$ ) to be measured at a temperature from 24 °C to 26 °C and which satisfies the following expression (1)

$$0\text{mN/m} \leq dl \leq 15\text{mN/m} \quad (1)$$

wherein said coloring agent comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19, and (3) at least one selected from the group

consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I. Pigment yellow 150, and C.I. Pigment yellow 180.

48. (Currently Amended) An ink set comprising:

~~the ink composition of claim 35;~~

~~the ink composition of claim 36;~~

~~the ink composition of claim 37; and~~

~~the ink composition of claim 38~~

an ink composition comprised of a coloring agent, an organic solvent, water, and a surfactant having difference  $dl$  ( $\sigma_{10} - \sigma_1$ ) which is difference between dynamic surface tension ( $\sigma_{10}$ ) of the solution obtained by making 0.1 wt% solution dissolved in purified water to be measured by using a maximum bubble pressure method at the bubble frequency of 10Hz at a temperature from 24 °C to 26 °C and dynamic surface tension ( $\sigma_1$ ) to be measured at a temperature from 24 °C to 26 °C and which satisfies the following expression (1)

$$0\text{mN/m} \leq dl \leq 15\text{mN/m} \quad (1)$$

wherein said coloring agent comprises at least one pigment selected from the group consisting of (1) at least one selected from the group consisting of C.I. Pigment blue 15:3 and C.I. Pigment blue 15:4, (2) at least one selected from the group consisting of C.I. Pigment red 122, C.I. Pigment red 209, and C.I. Pigment violet 19, (3) at least one selected from the group consisting of C.I. Pigment yellow 74, C.I. Pigment yellow 138, C.I.



Pigment yellow 150, and C.I. Pigment yellow 180, and (4) carbon black.

49.(Original) An ink head comprising:

an ink tank for storing the ink composition of claim 27;

an ink chamber having a discharge port for discharging a liquid droplet of the ink composition and receiving a supply of the ink composition from the ink tank;

a piezoelectric element generating a strain in response to an applied voltage and provided at least in a part of the ink chamber thereby applying a pressure to the ink composition contained in the ink chamber; and

an electrode provided for applying a voltage to the piezoelectric element.

50.(Original) An ink head comprising:

an ink tank for storing the ink composition of claim 27;

an ink chamber having a discharge port for discharging a liquid droplet of the ink composition and receiving a supply of the ink composition from the ink tank;

a heat generating member provided in at least a part of the ink chamber and adapted to heat the ink composition contained in

the ink chamber to generate a bubble therein thereby applying a pressure to the ink composition; and

an electrode provided for applying a voltage to the heat generating member.

51.(Original) A recorded image recorded by a deposition of a liquid droplet of an ink composition, discharged by the ink head of claim 49, onto a recording material.

52.(Original) A recorded image recorded by a deposition of a liquid droplet of an ink composition, discharged by the ink head of claim 50, onto a recording material.